each repeated pass, the bits within the current group of those coefficients which were previously flagged on an earlier pass,

(2)   the decoder being arranged to maintain a running record, as transmission between the coder and the decoder proceeds, of the coefficients which are currently significant.

REMARKS

Claims 1-19, 21 and 22 are pending in the present application. The Examiner has rejected claims 1-19, 21 and 22. By this Amendment, Applicants have amended claims 1, 17 and 22. Applicants respectfully submit that no new matter was added by these amendments. Accordingly, claims 1-19, 21 and 22 are at issue.

The Examiner has indicated that the amendment to claim 1, submitted in the Preliminary Amendment filed August 17, 1999, was not entered because it did not include a parenthetical expression indicating the status of the claim as amended or newly amended. By this Amendment, claim 1 as been amended to indicate its status as "amended." The present amendment to claim 1 includes the modifications set forth in the Preliminary Amendment, as well as some additional modifications. These additional modifications clarify that claim 1 is directed to a method for selectively flagging the coefficients that "first become significant" in the bit plane at issue.

The Examiner has rejected claims 1-19, 21 and 22 under 35 U.S.C. §103(a) as being unpatentable over De With et al., in view of Xiong et al. Applicants respectfully traverse this rejection.

Claim 1, as amended, is directed to a method for compressing an image that is divided into a plurality of blocks. The blocks are transformed into a plurality of coefficient blocks, where the coefficients are digitized to form a plurality of bit planes for each coefficient block. After defining a group of bit planes and starting with a most significant bit plane, claim 1 requires "selectively flagging those coefficients which first become significant within the group." These selected bits are then transmitted. That is, the method is directed toward flagging and transmiting bits from those

coefficients in a bit plane that have become "significant" within the group. As explained on page 4 of the present application, "[t]he philosophy of significance switching, as used in the present invention, is that the overheads introduced will be compensated for by the saving in not transmitting bits for small coefficients until they are switched on."

Unlike the present invention, De With et al., transmits all of the bits of the coefficients in a bit plane, regardless of whether each coefficient has become "significant." That is, De With et al., is not concerned with compressing the image in the manner of claim 1 of the present application. The method described in De With starts by dividing an image to be compressed into a plurality of image blocks, and then carrying out a 2-D block transform (DCT) on each block to produce a corresponding plurality of coefficient blocks. These are the "datablocks" which are shown in Figure 1A of De With et al. As mentioned at column 4, lines 4-6 of De With et al., the coefficients of each block are then subjected to variable-length coding to produce a number of variable-length codewords. The individual bits within each of these codewords are shown in Figure 1. Once the coefficients have been digitized (into "codewords" using the terminology of De With et al.), they may be read out bit plane by bit plane, as is described at column 5 lines 3 to 8. Specifically, all of the bits from the most significant bit plane are transmitted first, then all of the bits from the second bit plane and so on. The process continues until the least significant bit plane is reached.

The approach disclosed in De With et al., requires a large number of leading zeros to be transmitted (i.e., for those coefficients or codewords that have not yet become significant). This is inefficient, and is precisely the problem intended to be dealt with by the present invention. In the method of claim 1 (as applied to the example disclosed in Figure 2 of the present application), leading zeros are not transmitted, and for a given group of bit planes nothing is sent until a coefficient has become "significant." As illustrated in Figure 2 of the present application, under the method of claim 1 no bits are transmitted for the coefficient "E" until the first significant "1" bit is reached, at bit plane 2 (i.e., at that point coefficient "E" becomes "significant"); likewise, no bits are transmitted for "F" until the first significant "1" bit is reached at bit plane 3. In contrast, the

device of De With et al., would have transmitted the leading zeros for both "E" and "F" if presented with the bit planes of Figure 2 of the present application.

The Examiner maintains that the step of selecting those coefficients which first become significant at a particular level is disclosed at column 6, lines 48-52 of De With et al. However, there is no discussion of any selection or flagging going on at this location of De With et al. The reference to the four 'most significant bits' at line 48 of column 6 clearly refers to the four most significant bit planes of the block taken as a whole. Using this terminology, the most significant bit of a given codeword may be 1 (e.g., as in coefficients "A" to "D" of the present application), but it may equally be 0 (e.g., as in coefficients "E" and "F" of the present application). That this is so would clearly be understood by a skilled man, since in the last line of column 6 of De With et al., there is a reference to "all seven bits" of the DC coefficients having been recorded. That is consistent with the use of seven-bit digitization in which the MSB always corresponds to bit plane 1, and the LSB to bit plane 7. It will be noted, in addition, that this is conventional terminology and the expressions MSB and LSB are used in an identical way in the present application (See e.g., page 5, lines 21 to 23, and Figure 1 of the present application). Step (e) of claim 1 requires selectively flagging those coefficients which "first become significant" at a particular point within the process; De With et al., simply sends all bits of all coefficients without making any selection whatsoever.

De With et al., does not disclose the feature of selectively flagging those coefficients which first become significant within a group (of one or more bit planes) as required by step (e) of claim 1. Because no selection has been made it follows that the remaining steps are not disclosed either.

Xiong et al., does not cure the deficiencies in De With et al. Xiong et al., simply provides a short discussion on the use of a DCT image coder with an embedded "zerotree quantizer." Xiong et al., does not disclose compressing the image in the manner required by claim 1. Specifically, among other things, Xiong et al., does not teach or suggest "(e) selectively flagging those coefficients which first become significant within the group" or the steps following this step.

Accordingly, for the reasons set forth above, Applicants respectfully maintain that claim 1 is patentable over De With et al., either alone or as combined with Xiong et al. Claims 2-16 and 21 depend on claim 1, either directly or indirectly, and include each of its limitations. Therefore, Applicants respectfully submit that claims 2-16 and 21 are also patentable over De With et al., and Xiong et al.

Claim 17, as amended, is directed to a coder for encoding and compressing images. Similar to claim 1, claim 17 requires "means for selectively flagging those coefficients which first become significant within the group." Accordingly, for the reasons given above with respect to claim 1, Applicants respectfully maintain that claim 17 is also patentable over De With et al., and Xiong et al. Claims 18-19 depend on claim 17, either directly or indirectly, and include each of its limitations. Therefore, Applicants respectfully maintain that claims 18-19 are also patentable over De With et al., and Xiong et al.

Claim 22, as amended, also requires "means for selectively flagging only those coefficients which first become significant within the group." Accordingly, for the reasons given above with respect to claim 1, Applicants respectfully maintain that claim 22 is patentable over De With et al., and Xiong et al.

CONCLUSION

Applicants respectfully maintain that all claims in the present application are considered to be in condition for allowance, and notice to that effect is earnestly sought at the Examiner's earliest convenience. If any informalities remain, the Examiner is requested to call the undersigned attorney in order to expedite the prosecution of the present application.

Response to April 5, 2002 Office Action
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Attorney Docket No. 3838 P 003

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The Commissioner is hereby authorized to debit any payment deficiencies as they relate to the present Response to Office Action or credit any overpayments to our deposit account no. 23-0280.
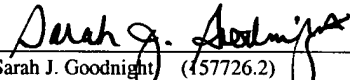
Respectfully submitted,

Date: October 4, 2002   By: _Richard Himelhoch_

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